DOCUMENT RESUME

ED 353 304 TM 019 368

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TITLE Assessing Construct Validity in Community Evaluations: A Multitrait-Multimethod Approach.
PUB DATE Nov 92
NOTE 31p.; Paper presented at the Annual Meeting of the American Evaluation Association (Seattle, WA, November 5-7, 1992).
PUB TYPE Reports - Evaluative/Feasibility (142) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Community Organizations; *Community Programs; Comparative Testing; *Construct Validity; *Evaluation Methods; Factor Structure; Interviews; *Multitrait Multimethod Techniques; *Program Evaluation; Rural Areas; *Test Construction; Test Reliability
IDENTIFIERS Community Environment Scale; Community Needs Index; Self Report Measures

ABSTRACT

This study used multiple methods to assess basic community needs and attributes of community atmosphere (cohesion, religious involvement, and recreational activities) in two psychometric studies. Part 1 revised self-report community assessment measures, developed multi-item scales for each construct, and tested reliabilities and factor structures of the 22-item Community Needs Index (CNI) and the 40-item Community Environment Scale (CES). The CNI and CES were given to 27 members of civic organizations in 2 rural communities. Part 2 used a non-verbal assessment method to assess the same constructs as the self-report measures and added photo observation and photo-assisted interviews. Three measures were used across nine community dimensions (cohesion-concern, rural uniqueness, community pride, intellectual/cultural activities, religious involvement, conflict, outgoingness/involvement, local resources, and openness/expressiveness) to produce a multitrait-multimethod (MTMM) approach to community assessment. The MTMM matrix included data from the CNI, CES, photo observations, and photo-interviews; and used six CES scales. The construct validity of community assessment measures should not be taken for granted. Different methods do not assess the same constructs. Method variance, not substantive variance, may play a large role in the reliable variance captured by a specific trait-method-unit. Overlapping measures can be combined to enhance reliability and reduce irrelevant method effects. One table and three figures are included. (RLC)

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# Assessing Construct Validity in Community Evaluations: A Multitrait-Multimethod Approach

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November 5, 1992

Running Head: MTMM Community Evaluation

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The community assessment literature includes models and approaches designed to profile a community and its needs. Innes and Heflinger (1989) report that although recent publications contain more detailed and sophisticated descriptions of methods than those in the past, most community needs assessments still rely on one or more of five basic approaches identified by Warheit et al. (1976). These approaches include: key informant interviews, the community forum, rates-under-treatment, social indicator analysis, and broader community surveys. Our past two years experience evaluating a rural health grant has demonstrated that the key informant interviews and community forums can produce a rich, contextual picture of the community, but they often fail to provide a reliable statistical profile of baseline measures for the community. Conversely, rates-under-treatment, social indicators, and surveys are good for assessing the magnitude of differences within and between communities, but they may not sufficiently address the specific needs of a community. As a result, exclusive reliance on any one of these approaches may fail to achieve a completely accurate or practically useful assessment of communities.

In addition to the various publications concerned with assessment approaches are articles similar to Finnegan and Ervin's (1989), who describe community assessment as a "process". Process models describe how data are collected, examined, synthesized, and evaluated. Consequently, with much of the community assessment literature focused on approaches and

process, little attention has been given to measurement issues such as reliability, convergent validity, and discriminant validity. As a result, traditional approaches to community assessments often assume that different methods of measuring similarly labeled constructs are reliable and valid measures of the same thing. In sum, our literature review raises serious questions regarding the measurement procedures currently used in community assessment. This discovery leads to several suggestions for introducing important measurement considerations into the process of community assessments. First, multiple methods to measure the same community constructs must be employed if we are to improve the construct validity in community assessments. This use of a broader range of methods should improve the breadth and accuracy of measurement in community assessment. Second, given the small sample sizes usually characteristic of rural health research, the use of multiple measures will improve the generalizeability of our assessments.

Improving Construct Validity

In order to assure construct validity, a community assessment model should employ multiple methods that make possible the determination of both convergent and discriminant validity. One might think that the list of methods identified by Warheit et al. (1976) is sufficient to eliminate any uncertainties about measurement problems, but the use of multiple types of information is useful only if those types are used to

assess the same constructs. For example, if medical needs in a community are assessed by noting the number of persons under treatment for diabetes and educational needs are assessed by a community survey concerning adequacy of its schools, no gain is produced by using two different sources of information.

Moreover, what is wanted are types or sources of information that are independent of each other, i.e., that do not have methods-of-measurement factors in common. Even if an assessment model employed a combination of key informant interviews and a community forum to get at some characteristic of a community, say its cohesiveness, these two approaches are fairly similar, qualitative methods that may produce convergent validity only because of their similarity, e.g., because key informants are likely to be present at any community forum and may even dominate it.

Since part of the convergent validity of measures may be related to method bias over and above any construct variance, it is generally desirable to use multiple, different measures in order to triangulate on the construct of interest. For instance, if one were trying to measure elderly access to health care in a rural area, multiple measures could include key informant interviews, paper-and-pencil questionnaires completed by senior citizens, and intake statistics from local doctors. This methodology would follow Campbell and Fiske's (1959) suggestion that a construct should be different from methodological irrelevancies.

In addition to convergent validity, however, those doing community assessments ought to pay attention to the need to demonstrate discriminant validity. That is, measures intended to get at different constructs, e.g., community resources and community needs, should not correlate too highly. Measures of different constructs should not correlate as well as do different measures of the same construct. If a community survey shows that assessments of recreation resources in the community correlate highly with assessments of recreational needs, then only one construct would appear to be at issue.

Small Sample Sizes

Rural community assessments often suffer from a lack of statistical power due to the small sample sizes that are available. Low statistical power limits the choice of statistical procedures and creates problems with parameter estimation and hypothesis testing (e.g., failing to detect important trends in the data--Type II errors). Given this lack of statistical power, it becomes even more imperative that the measures used are precise and reliable. Aggregating across multiple measures improves reliability and, as a result, may alleviate some of the problems created by small sample sizes. The more measures that have been used, the more likely one is to be able to detect meaningful patterns in the data and generalize these patterns to other samples. In order to appropriately aggregate across measures, however, the measures must be shown to assess the same constructs (e.g., by an MTMM analysis).

Aggregating across dissimilar measures can reduce the reliability and validity of community assessments.

Small Populations

It is very easy to select biased samples from small populations. Compared to urban areas, in rural areas relatively few people fill certain roles in the community. Undersampling or oversampling from a subgroup of a small community can easily bias the sample. For instance, there may be many doctors in the city, but few in a rural community. If nobody asks a rural doctor about a particular topic, then the medical perspective might be completely missing from the sample.

To avoid likely problems with biased samples this project employed a stratified purposive sampling strategy. The specifics of this procedure will be presented later; however, in general, the stratified purposive sampling involves identifying representative subgroups within a community that are comparable to similar groups in other communities. Thus, the sampling procedure combines elements of stratified and matched subject selection strategies.

## STUDY

For the past two years, we have been involved in the evaluation of an interdisciplinary rural health grant. One of our tasks has been to determine the effects of interdisciplinary student health care team projects on two rural communities in southeastern Arizona. As a result, we have first-hand experience at recognizing the difficulties that arise when one attempts to

evaluate programs using data from community assessments composed of descriptive data and a few, imprecise baseline measures.

The following study was designed to measure two general types of constructs using more than one method to assess each construct. The first general category of constructs is basic community needs, for example, health care, economic, and adolescent needs. The second general category of constructs consists of different attributes of community atmosphere such as cohesion, religious involvement, and recreational activities.

The study is comprised of two separate psychometric studies. Part one is designed to revise existing self-report community assessment instruments and to develop multi-item scales for each construct. The second part used a non-verbal assessment method to measure the same constructs as the self-report measures. This second study introduces two similar, but distinct methods, photo observation and photo-assisted interviews.

The primary emphasis of this community assessment exercise is a MTMM analysis of self-report and photographic data. The analysis incorporates three unique measures across nine community dimensions to produce a multitrait-multimethod approach to community assessment.

Part One: Development of Self-Report Measures

The first stage of the overall study is designed to test the reliabilities and factor structures of two self-report questionnaires: The Community Needs Index and the Community Environment Scale (scales will be discussed later).

Sampling procedure: The paper-and-pencil questionnaires were administered to members of various civic organizations in both communities. Civic groups were selected according to a stratified purposive sampling procedure. Rather than trying to select a random sample from each community, probably unsuccessfully, and knowing little about those actually available, this unique sampling method was identified to improve upon generalizeability. By sampling eight comparable civic and interest groups from both communities, we were able to gain a sample of people who were at least similar concerning their community interests and involvement. Groups sampled included: Business and Professional Women's Club & Merchants Association, Chamber of Commerce, Eastern Star, Masons, Lions Club, Rotary Club, V.F.W., and W.A.S.A. (group against substance abuse).

The Community Needs Index (CNI): The CNI contains 22 questions about specific areas of need that may be a problem for the community members or their families. The needs addressed in the CNI were derived from data collected the previous year in the same two rural communities by Babcock, Gallagher, & Sechrest (1991). This pilot study identified the following areas of need as stress-producing for the communities: limited medical and mental health care, economic concerns, limited social services for the elderly, few adolescent activities, a lack of parenting resources and crime. Each dimension of need is measured on the questionnaire by a five-point rating scale and is designed to represent how stressful a particular deficiency might be. The

intensity of unmet needs may range from being "barely noticeable" to "almost unbearable".

A principle factors analysis with 87 observations was used to assess the common variance in the CNI items. Using a promax rotation, three factors were extracted on the basis of scree, proportion, and interpretability criteria. Factor One identified health concerns, and Factor Two represented social problems related to teenagers. Factor Three addressed economic concerns. The pattern of inter-factor correlations suggest that health concerns correlate 0.46 with teenage problems, possibly because teenage mental health issues were included within the context of broader adolescent concerns. The other inter-factor correlations were below the cutoff value for salient loadings (0.35).

Given the high factor loadings for the three factors derived from the instrument, we can assume that good inter-item reliability exists. Test-retest reliabilities on a sample of twelve subjects indicate that most of the items used in the factor analysis are reliable across time. It must be noted, however, that the reliability study is based on a very small sample and, as a result, the estimates might not generalize to a larger sample.

The Community Environment Scale (CES): The CES contains 40 items designed to identify community traits. The CES is our revision of The Family Environment Scale (Moos,1974b), adapted and expanded to assess rural communities. This instrument contains the following rationally derived subscales: community

cohesion/concern, expressiveness, community pride/support, conflict, community involvement, intellectual/cultural activities, moral/religious involvement, recreational/sport activities, basic needs, and characteristics of rural living. Each item was rated on a five-point scale ranging from "not at all" to "very true".

A principle factors analysis was performed on data from 97 subjects using a varimax rotation. Nine factors met the extraction criteria (a combination of scree, proportion, and interpretability). Interpreting the factor analysis resulted in the following labels: cohesion/concern, rural uniqueness, community pride, intellectual/cultural activities, religious involvement, conflict, outgoingness/involvement, local resources, and openness/expressiveness. The test-retest reliabilities for the CES were performed on the same 12-person sample as the CNI and they indicate fair reliability over time (reliabilities are included Figure 3).

Part Two: Development of the Photograph Methods

An important assumption of the MTMM approach is that methods must be different or distinguishable from each other. In other words, while each method in MTMM matrices should converge on the same substantive construct, they should not converge on the same "irrelevant" constructs. For example, the paper-and-pencil, self-report instruments provide a researcher's perspective because the subjects were responding to questions imposed upon them by the researchers. The photographic method, on the other

hand, allows the subject to introduce their insider perspective to the assessment. Combining the self-report and pictorial methods therefore cancels the insider and outsider biases. Although both perspectives are valued, combining the two perspectives in an MTMM study helps to determine whether or not respondents are referring to similar constructs, albeit from different view points.

It was important to employ methods that would not only provide baseline measures of need, but would also capture contextual data. We were particularly interested in using a method that would provide data about a rural community's atmosphere, or what it was like to live there. A unique method for identifying a person's orientations has been developed by Robert Ziller. Ziller and colleagues (Combs & Ziller, 1977; Ziller & Smith, 1977; Ziller & Lewis, 1981; Ziller & Rorer, 1985; Ziller & Okura, 1986) have refocused and extended Worth and Adair's (1972) photographic approach to orientation by having students take pictures to represent "who they are". Ziller (1990) notes that the photographic approach is a non-verbal form of communication and that it may be the preferred representational system for subjects with communication difficulties or across cultures. Ziller's approach, consistent with the theory of orientations, analyzes the photographs by using content analysis, which involves environmental as well as social constructs.

Photo Observations

The second method employed involved photo observations that were taken by fourteen members of each community. Most of the community members selected to be involved in photographing their communities were previously identified key informants. These individuals had careers or civic responsibilities that enabled them to know a great deal about the concerns in their communities. Additional people were added in order to make the sample more representative of each community (See Table 1).

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Insert Table 1 about here

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Each MTMM informant was given a 110 instamatic camera with 12 exposures of colored film. They were given the following instructions:

> Place yourself in this situation. You are sending a series of 12 photographs one by one through the mail to someone who will be visiting your community for the first time. You want to give a true impression of your community.
> We are not concerned with your photographic skill, only with how you see your community. Remember, take photographs of anything (or anybody) that helps to communicate what it is really like to live in your community.

Using this method, the orientations of the community members are recorded photographically; essentially, we are asking the individuals to use a nonverbal method to "tell us more about your community". These orientations are analyzed through content analysis in an effort to understand insider's perceptions of their communities. Categories that emerged from the 27 sets of pictures include: sports and recreational activities, community


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**Stratified "Key Informant" Sample**

| TOWN ONE | TOWN TWO |
|---|---|
| Town Mayor | Town Mayor |
| Police Detective | Sheriff's Deputy |
| Fire Dept. Chief | Firefighter |
| Business Owner | Business Person |
| School Principal | School Teacher |
| Hospital Nurse | Public Health Nurse |
| Baptist Minister | Catholic Priest |
| Beautician | Beautician |
| Post Office Clerk | Rural Postal Clerk |
| Homemaker | Homemaker |
| Adolescent | Adolescent |
| Senior Citizen | Senior Citizen |
| RV Park Owner | RV Park Owner |
| Service Group Leader | Service Group Leader |

Table 1.

cohesion, community pride, rural uniqueness, economics, intellectual/cultural orientations, religious involvement, adolescent welfare, social services, and health care services. Each category contained four or more photographic elements that might represent that category. For instance, community pride was represented by pictures that showed 1) symbols of community pride such as banners with the name of the school, its logo or mascots, 2) pictures of community volunteers or volunteer organizations, 3) multi-generation or family owned businesses, 4) well-maintained private residences, and 5) pictures showing the work of local artisans.

Four coders practiced the coding system until near perfect agreement was reached on training photos. Although the photographic content reflects the community members' insider perspective, the photographic elements in the coding scheme were selected from an outsider's viewpoint. The coders had little disagreement about what they saw in the photos as is demonstrated through their high inter-rater reliability.

Photo-Assisted Interviews

In contrast to the previous method, this method incorporates interviewing the MTMM participants about the photos they submitted. When the photographs were developed, each of the 27 participants was given copies of his or her pictures and was interviewed at length. Participants were asked to explain the focal point of each photo, where the photo was taken, why they selected a particular photo content, and what they wanted to

communicate about their community. In addition, the participants were asked what other photos they might have taken if they'd extra time and film. The interviews help to further clarify the meanings of the photos that are initially communicated nonverbally. They also provide a true insider's perspective because with this method, coding interpretations are made based upon what the participants said about the pictures in addition to what the photo shows.

The 27 sets of photos were coded by the researchers using the same coding scheme used with the photo observation procedure. Information from this coding system was then supplemented with interview data. For example, interviews added a new element, community modernization, to the pride category that was not previously identified. It was hypothesized that the photo-assisted interviews and the photo observation method would be highly correlated, but would also have discriminant validity because they have different irrelevancies.

MTMM Analysis

A multitrait-multimethod matrix was designed to assess the validity of these methods as well as to detect any trait-method biases. Although each of the methods supplied differing data contents, the constraints of the matrix required the inclusion of only those data that were shared across each of the methods. Therefore, the matrix is constructed to include the three methods across nine community constructs. The first three constructs represent basic community needs along the dimensions of the

economics, health care, and adolescent welfare. The second grouping of constructs depict the community's atmosphere through the dimensions of community cohesion, community pride, and characteristics of rural living. The final set reflects what it is like to live in these communities through the dimensions of recreational activity, intellectual/cultural orientations, and religious involvement.

The relationship between measures, substantive constructs, and method constructs is depicted in Figure 1. The square boxes in the center of the figure are the trait-method units, the circles to the right contain the three methods, and the ovals to the left contain the community assessment constructs of interest.

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Insert Figure 1 about here

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The MTMM matrix is composed of data collected from each of the 27 participants who completed the CNI, CES, photo observations and participated in the photo-interviews. Although our original sample included 14 participants from each of the two rural communities, one observation had to be dropped because one set of photos was not submitted. Since the CES measured a different range of constructs than the photographic methods, only six of the nine CES subscales could be used in the MTMM matrix. Scales that were, therefore, excluded from the MTMM matrix were conflict, outgoingness, and openness. Similarly, the constructs captured by the photographic methods did not exactly correspond

# MTMM APPROACH TO COMMUNITY ASSESSMENT

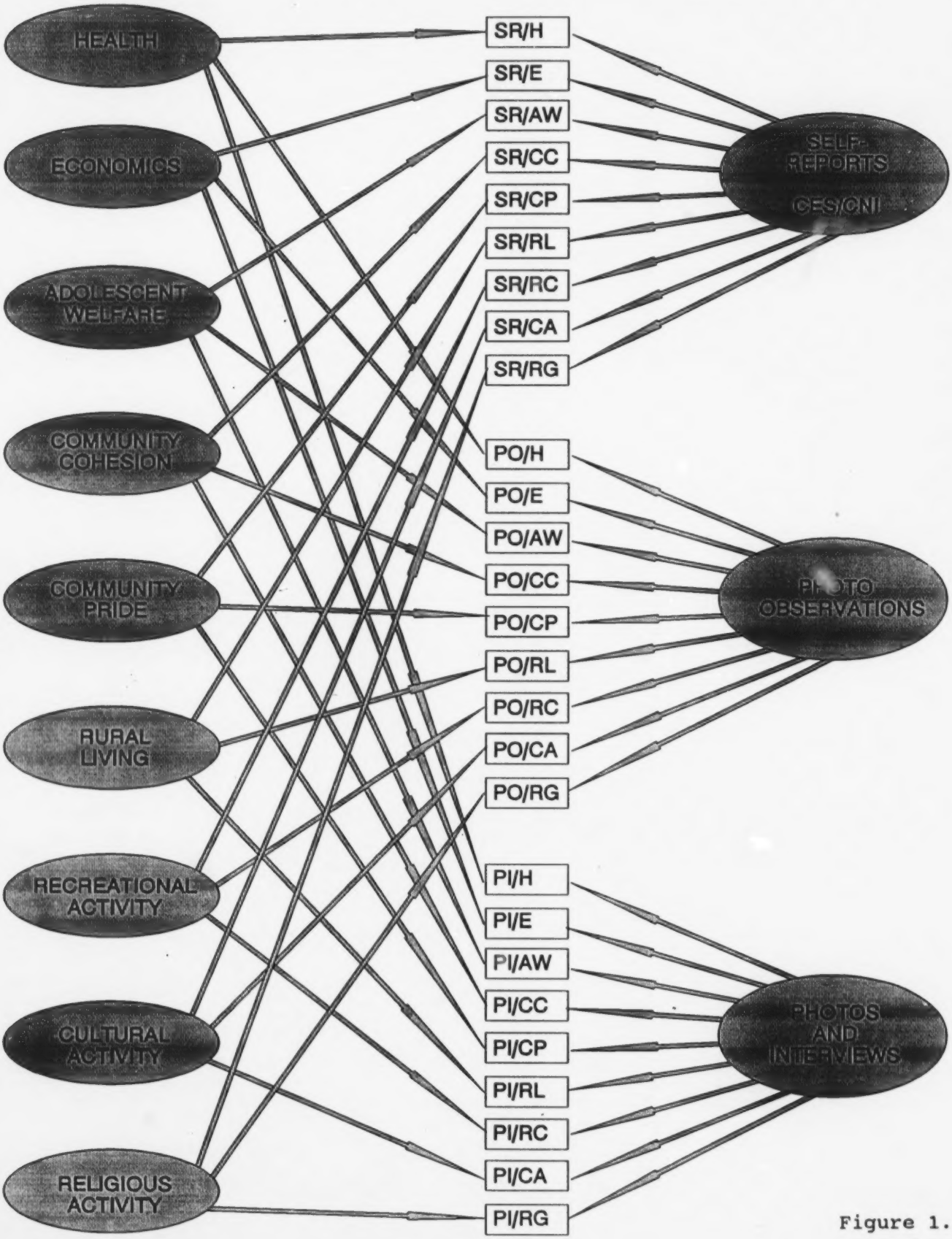


Figure 1.

with the self-report measures. Consequently, the social service category was omitted and the aesthetic orientation and rural uniqueness categories were combined.

The scores entered in the MTMM matrix for Method One are the factor scores constructed from the self-report (SR) instruments. Method Two scores, based on the photo observations (PH), are calculated by taking the category totals divided by the number of photos contained in each set. A few of the sets contained fewer than 12 photos; therefore, in order to keep comparisons across subjects equivalent, category totals were divided by the total number of photos for each subject. Scores for Method Three, photo-assisted interviews (PI), were adjusted in a similar manner as Method Two. The category totals for the photo-assisted method, however, were adjusted by the total number of photos plus one when the MTMM subjects reported additional photos they wish they had taken.

## RESULTS

The first MTMM analysis generated a 27x27 matrix (nine constructs X three methods). This matrix contains the bivariate correlations for each unique trait-method unit. This analysis indicated that the two photographic methods had high convergent validity with each other. However, the neither of the photographic methods converged on the constructs measured by the self-report methods. This indicated that photographic and self-report methods might be measuring different constructs. With this in mind, and in order to make the comparison between the

three methods easier to present, two separate analyses of MTMM matrices are provided.

The matrix presented in Figure 2 contains the two different photo methods: photo observations and photo-assisted interviews. This 18 X 18 matrix (nine constructs and two methods) is a subset of the 27 X 27 matrix with the self-report method excluded. The reliability diagonal for the photo observation methods (the monotrait-monomethod diagonal at the top of Figure 2) reveals a high degree of inter-rater reliability. No reliabilities are available for the diagonal representing the photo-assisted interview method (these missing reliability are depicted by X's along the monotrait-monomethod diagonal at the bottom of Figure 2).

The center diagonal in Figure 2 (the monotrait-heteromethod or validity diagonal) shows large, significant bivariate correlations. This pattern of correlations along the diagonals demonstrates high convergent validity for these two methods. Furthermore, the small number and inconsistent pattern of correlations in the off-diagonal elements of the MTMM matrix are indicative of high discriminant validity. In other words, although the two methods are expected to share "outsider" and "insider" biases, respectively, these or other shared biases within methods did not lead to correlations between constructs. Thus, it can be concluded that the two different photo methods are measuring similar constructs and using these two different methods might control for at least some systematic method

effects. Without using sufficiently heterogeneous methods, however, it is impossible to determine how much of the shared variance across the two photo methods is due to common trait or common method variance.

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Insert Figure 2 about here

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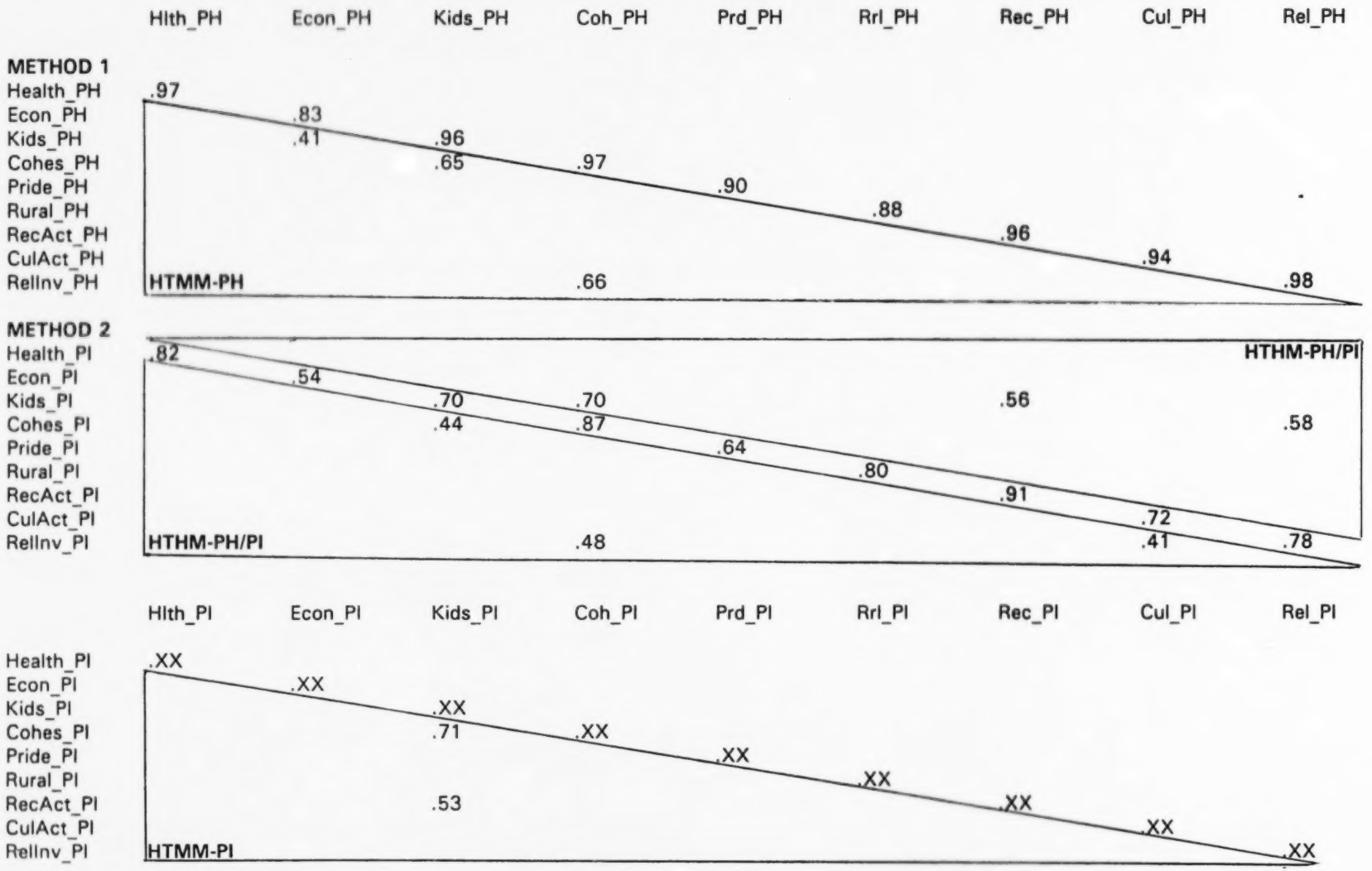
It should be noted that the matrix presented in Figure 2 includes a few significant off-diagonal correlations. This indicates that some of the constructs measured are either correlated or confounded with other constructs. For example, the cohesion and kids factors are correlated in both the heterotrait-monomethod and heterotrait-heteromethod blocks. This might indicate that the cohesion and kids factors are correlated in the "real" world (i.e., there are substantive inter-factor correlations between these factors). On the other hand, the correlation between these factors might be attributed to method effects. Rules for the coding procedure may have created the correlation between these two factors (e.g., instructing raters to code photos of kids playing together in the park as both kids and cohesion).

The matrix presented in Figure 3 is the MTMM for the self-report method (SR) and the mean of the photo methods (PX). Based on the demonstrated high convergent and discriminant validity of the two photo methods, these two methods were synthesized to yield one valid summary score.

Figure 2.

**MTMM MATRIX**

**Photo Observations and Photo Interviews**



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Insert Figure 3 about here

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The monotrait-monomethod diagonal at the top of Figure 3 presents the test-retest reliabilities for the CNI and CES. As noted earlier, these reliabilities are based on traits that may change over time, therefore, it is not surprising that the coefficients are low. The monotrait-monomethod diagonal at the bottom of Figure 3 displays the inter-rater reliabilities between the four coders (PH) and the researcher (PI). These reliabilities are high, demonstrating good inter-rater reliability even when it is calculated across different methods.

The monotrait-heteromethod (validity) diagonal in the middle of Figure 3 shows low, insignificant bivariate correlations between these two methods. This indicates that there is very poor convergent validity for the photographic and self-report methods. This lack of convergent validity might be attributable to several sources, such as the unreliability of the self-report measures or the possibility that the self-report and the photo methods are not measuring the same constructs.

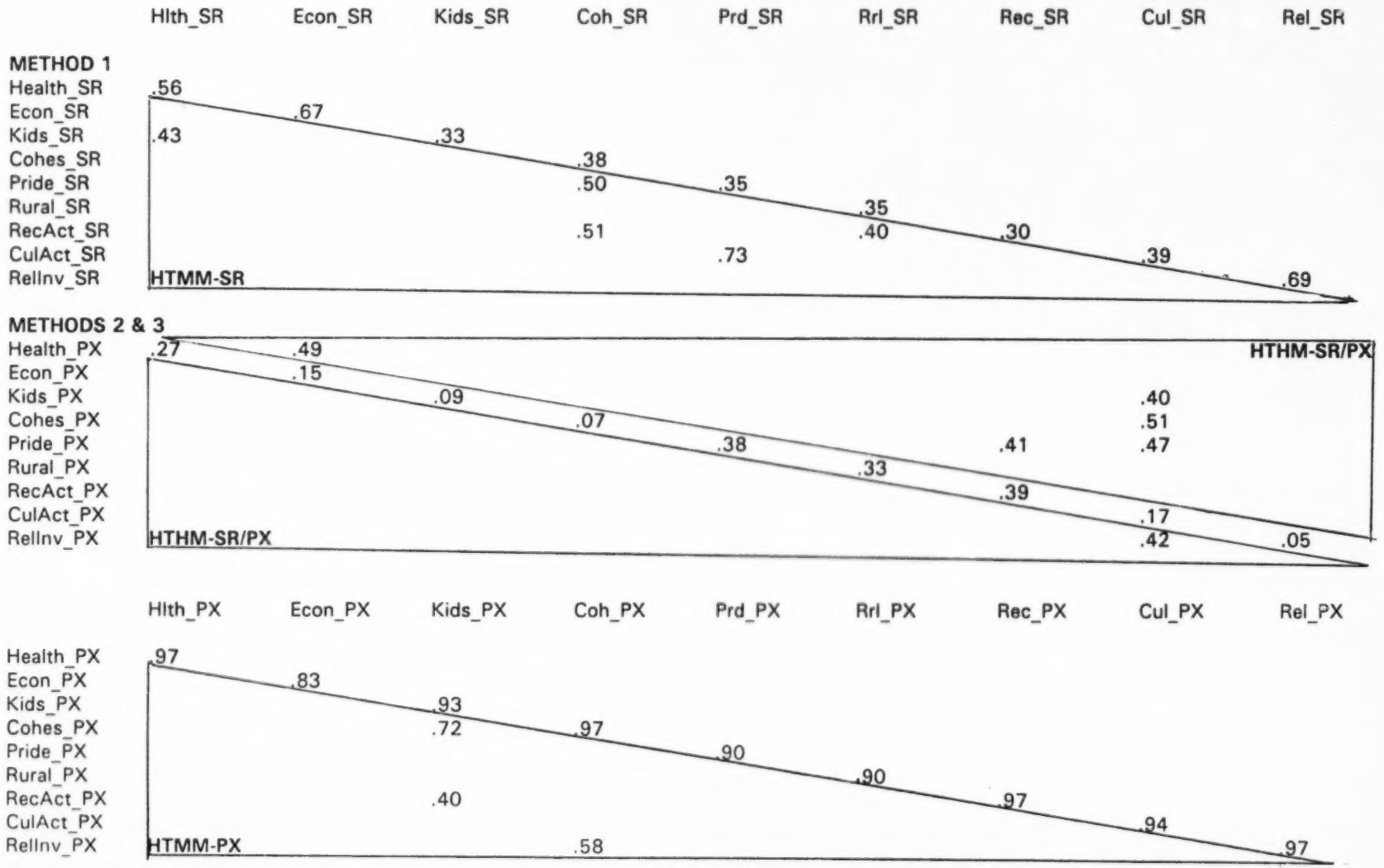
## DISCUSSION

Although we had hoped that all methods would measure the same constructs, this was not the case. This disappointing finding does, however, illustrate the importance of using multiple methods on the same construct to assess construct validity. If the methods had been used separately on each the

Figure 3.

**MTMM MATRIX**

**Self-Reports and Photo Methods**



nine constructs, the construct validity of these measures might not have been questioned. Thus, failing to do an MTMM study may have allowed different constructs with the same labels to be treated as if they were the same thing.

Furthermore, it is important to note that even though the constructs have the same labels, only partial attributes of the constructs may be measured or the constructs may be something altogether different. It is not uncommon for different methods to measure partial attributes of constructs, especially when these method represent insiders and outsiders perspectives. Nor is it uncommon for labels to have semantic differences in meaning. For instance, the construct identified as "pride" in this study appears to be more like "cohesion" to the key informants. These differences exemplify the importance of checking for construct validity in community assessment; otherwise, only parts of the picture may be presented as the whole.

The results indicate that the verbal measures (CNI and CES) are tapping into something different from the nonverbal photo measures. In other words, what community members may tell us about their communities may be different from what they show us. This lack of convergence may be due to procedural effects, such as the possibility that it may be easier to talk about cohesion than to depict it photographically. Similarly, there may be a method effect such that 12 photographs captures a narrower spectrum of living than broader-based (e.g., 40 item) self-report

questionnaires. Furthermore, in the photo method there may be linear dependencies between categories. In other words, selection of one type of photographic construct (e.g., historic buildings) may be linearly dependent with other constructs (e.g., modernization).

Another reason for the lack of convergence between the photographic and self-report methods may be due to the relative reactivity of the two methods. Compared to the photographic method, subjects using the self-report method may be more likely to respond to demand characteristics or self-presentational concerns. This seems to be the case for the construct of religious involvement. The self-report data indicates that attending church or religious involvement is highly important to community members, and yet, the photo data show it to be less important.

Finally, although the purpose of this paper was not necessarily to promote the use of a particular method, we would like to stress the fact that the photographic method seemed to be quite useful in our community assessment. The informants stated that, compared to responding to the self-report measures, they invested considerably more time, thought, and effort into taking the photographs. Moreover, the participants seemed to enjoy taking the photographs and presenting them to the researchers. Perhaps it might be worthwhile to interview people about questionnaires; however, the questionnaires seem to be less personally relevant and less interesting to the subjects.

In sum, a picture may really be worth a thousand words.

## CONCLUSIONS

The results of this study support the notion that the construct validity of community assessment measures should not be taken for granted. It is quite clear that different methods did not measure the same constructs. The results also indicate that method variance, rather than substantive variance, may be a large component of the reliable variance captured by a particular trait-method-unit. Thus, researchers who use different methods may be measuring different things.

These findings support the claim that community assessments should not be addressed with piecemeal methods that patch together an incomplete and potentially distorted view of the community. Multiple measures should be judiciously selected in complementary and overlapping manner. Measures that overlap, such as the two photographic methods, can be combined to enhance reliability and reduce the impact of "irrelevant" method effects. Measures that do not overlap may make unique contributions to community assessments that are worthwhile even though the meaning of the unique variance may not be completely understood. Hopefully, more of the unique variance in community assessments will become better understood through psychometric investigations such as MTMM studies.

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